PATENT COOPERATION TREATY

From the INTERNATIONAL BUREAU

PCT

NOTIFICATION OF ELECTION

(PCT Rule 61.2)

To:

Assistant Commissioner for Patents
United States Patent and Trademark Office
Box PCT
Washington, D.C.20231
ETATS-UNIS D'AMERIQUE

in its capacity as elected Office

Date of mailing (day/month/year) 14 June 2000 (14.06.00)	
International application No. PCT/DK99/00558	**Applicant's or agent's file reference** P9384PC00
International filing date (day/month/year) 15 October 1999 (15.10.99)	**Priority date** (day/month/year) 27 October 1998 (27.10.98)
Applicant VINDRIIS, Søren	

1. The designated Office is hereby notified of its election made:

[X] in the demand filed with the International Preliminary Examining Authority on:

15 May 2000 (15.05.00)

[ ] in a notice effecting later election filed with the International Bureau on:

2. The election [X] was

[ ] was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO **34, chemin des Colombettes** **1211 Geneva 20, Switzerland**	Authorized officer Manu Berrod
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PATENT COOPERATION TREATY

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INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference	FOR FURTHER ACTION	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
P9384PC00		
International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/DK99/00558	15/10/1999	27/10/1998
International Patent Classification (IPC) or national classification and IPC A43B13/40		
Applicant VINDRIIS, Sören		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 6 sheets, including this cover sheet.

   ☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

   These annexes consist of a total of 8 sheets.

3. This report contains indications relating to the following items:

   - I ☒ Basis of the report
   - II ☐ Priority
   - III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
   - IV ☐ Lack of unity of invention
   - V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations suporting such statement
   - VI ☐ Certain documents cited
   - VII ☒ Certain defects in the international application
   - VIII ☒ Certain observations on the international application

Date of submission of the demand	Date of completion of this report
15/05/2000	24.11.2000
Name and mailing address of the international preliminary examining authority: European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer Pregetter, M Telephone No. +49 89 2399 8379

Form PCT/IPEA/409 (cover sheet) (January 1994)

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/DK99/00558

I. Basis of the report

1. This report has been drawn on the basis of *(substitute sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to the report since they do not contain amendments (Rules 70.16 and 70.17).)*:
Description, pages:

1-6	with telefax of	04/10/2000

Claims, No.:

1-5	with telefax of	04/10/2000

Drawings, sheets:

1/1	as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

   These elements were available or furnished to this Authority in the following language: , which is:

   ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
   ☐ the language of publication of the international application (under Rule 48.3(b)).
   ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

   ☐ contained in the international application in written form.
   ☐ filed together with the international application in computer readable form.
   ☐ furnished subsequently to this Authority in written form.
   ☐ furnished subsequently to this Authority in computer readable form.
   ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
   ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

   ☐ the description, pages:
   ☐ the claims, Nos.:

☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims 1-5
	No:	Claims
Inventive step (IS)	Yes:	Claims 1-5
	No:	Claims
Industrial applicability (IA)	Yes:	Claims 1-5
	No:	Claims

2. Citations and explanations
see separate sheet

VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:
see separate sheet

VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:
see separate sheet

Re Item V

Reasoned statement under Article 35(2) with regard to novelty, inventive step r industrial applicability; citations and explanations supporting such statement

1. Reference is made to the following documents:

   D1: US-A-5 067 255
   D2: US-A-4 906 502

2. Document D1, which is considered to represent the most relevant state of the art, discloses (cf. column 3, lines 13-25; column 5, lines 18-37; column 5, line 67-column 6, line 9; figure 11) an insole equipped with a fabric according to the preamble of claim 1. The subject-matter of claim 1 differs in that the fabric is joined with the foil by enclosure in the foil to reinforce the mechanical strength of the foil, where the foil initially is heated up, where the fabric subsequently is pressed partly or totally into the foil, where the foil finally is cooled down, whereby that part of the fabric, which is pressed into the foil, is enclosed in the foil.

   The problem to be solved by the present invention may therefore be regarded as providing an insole-structure having improved creep resistance.

   This problem has not been addressed in any item of the cited prior art. Document D1 discloses a cover layer being attached by the use of a bonding material either to the upper or the lower surface or to both surfaces of the foil. The purpose of these cover layer is to enhance the comfort of the wearer. Furthermore, they cannot be used to efficiently increase the mechanical stability of the insole since they are not embedded in the foils as the fabrics of the present application.

   Document D2 discloses (cf. column 6, line 47-column 7, line 16; figure 3) a fabric-reinforced insole. However, this reinforcement does not extend to the whole of the extend of the foils between the regions where the topfoil is joined with the bottom foil as defined in present claim 1. Thus this type of reinforcement is not and cannot be used to improve the creep resistance of the insole.

Document US-A-5 025 575 discloses an inflatable insole formed of upper and lower plastic sheets which are bonded together in a continuous seam about their peripheral edges and may be covered by outer fabric layers to enhance the comfort of the inner sole. There is no indication therein as to the way in which the outer fabric layers are joined to the plastic sheets.

No further indications for combination or modification of the technical teachings disclosed in any item of the cited prior art have been found.

The subject-matter of claim 1 is therefore novel (Article 33(2) PCT) and involves an inventive step (Article 33(3) PCT).

The possibility of industrial application is obvious (Article 33(4) PCT).

3. Claims 2-5 are dependent on claim 1 and as such also meet the requirements of the PCT with respect to novelty and inventive step.

Re Item VII

Certain defects in the international application

a. Document US-A-4017931 discloses a method of manufacturing an insole but without applying any additional layer. The citation on page 2 of the description, lines 12-14, is therefore not correct (Rule 5.1(a)(ii) PCT).

b. With respect to page 4, line 7 of the description, the formulation "the joining can also be done in a way that the fabrics are partly enclosed in the foils" is not in consistency with independent claim 1, where this feature has been defined as essential for the definition of the invention (Rule 5.1(a)(v) PCT).

Re Item VIII

Certain observations on the international application

The embodiment of the invention described on page 4, lines 2-4 does not fall within the scope of the claims. This inconsistency between the claims and the description leads to doubt concerning the matter for which protection is sought, thereby rendering the claims unclear (Article 6 PCT).

An insole with fabric

Background of the invention

The present invention relates to an insole for footwear comprising a top foil and a bottom foil and one or more cavities, which are formed between the top foil and the bottom foil and filled with liquid or gel, and where the top foil and the bottom foil are impermeable with respect to the liquid and are joined together at least along the edge region.

The soles are intended for the relief of the foot, in particular the sole of the foot, by pressure equalisation, as pain in the foot and the sole of the foot is most cases is caused by concentration of pressure. Known soles use liquid contained in one or more cavities. The pressure of the contained liquid is approximately constant, and the soles will then allocate the pressure from the foot over a larger area, whereby pain in the foot or the sole of the foot is reduced. However, it is known that many kinds of material during constant load even below the yield point show permanent cold flow or creep.

The soles also have the disadvantage, that they cold flow or creep due to the continueing load, to which the soles are exposed. Thereby, the inner volume of the cavities increases so that the pressure-equalising effect is reduced and, along with that, the pain relieving effect. Furthermore, the temperature in footwear is between 20°C and 40°C, in which temperature range, the used plastic foils show a relatively large coefficient of expension for heat and a relatively large change of elasticity. As a result, the relief decreases as the sole gets warmer.

DE 40 01 542 describes such a sole, where the cavities are filled with a gas. By using a gas, a higher degree of shock absorption and/or continueing pressure equalisation is obtained, but the gas is more volatile than a liquid. Therfore, it is important that those foils which are used in such a sole have a sufficient low permeability for the used gas. To decrease the permeability and at the same time to increase the strength with regard to creep, the possibility of incorporating a film of, for example, polyethylene or polyu-

rethane in the foils forming the cavities is described. This increases partly the impermeability of the foils and partly the strength with regard to creep. The strength with regard to creep comes about by formation of a chemical coupling between the plastic making up the foil and the film contained in the foils.

It is a disadvantage that it is necessary to enclose the film in the foils, and for cavities filled with gas, diffusion of the gas is a much bigger problem than creep. The selection of material for the film and the way the film is enclosed in the foils is, therefore, primarily directed towards the purpose of increasing the impermeability rather than increasing the strength with regard to creep. This influences the selection of material, the selection of technique for joining the film and the foil, and the choice that the film is enclosed in the foils.

It is the object of the present invention to provide an insole that is primarily intended for cavities filled with liquid, and where the strength with regard to creep of the foils is essentially higher than for known soles, irrespective of whether they are intended for liquids, gasses or gels.

This object is accomplished with an insole that is characterised in that at least the top foil is equipped with a fabric, that the fabric extends to the whole of the extend of the foil between the regions where the topfoil is joined with the bottom foil, that the fabric extends parallel with the foil, preferentially extends outside the outer side of the foil, and that the fabric is joined with the foil by mechanical joining.

The object is also accomplished with an insole that is characterised in that at least the bottom foil is equipped with a fabric, that the fabric extends to the whole of the extend of the foil between the regions where the topfoil is joined with the bottom foil, that the fabric extends parallel with the foil, preferentially extends outside the outer side of the foil, and that the fabric is joined with the foil by mechanical joining.

In a preferred embodiment, the insole is characterised in that the top foil as well as the bottom foil are equipped with a fabric, that the fabric which is joined with the topfoil

as well as the fabric which is joined with the bottom foil extend to the whole of the extend of the foil between the regions where the topfoil is joined with the bottom foil.

An insole, where the foils are equipped with a fabric instead of discrete fibres and where the joining is done mechanically, implies that it is possible to undertake a precise increment of the mechanical strength of the foils by selection of specific materials and specific textures of the fabric, and also by selection of a certain orientation of the fabric in connection with the foil and in connection with the finally fabricated sole.

The selection of fabric depends primarily on the tensile strength of the fibres in the fabric because the strength of the foil joined with the fabric among other factors depends on the tensile strength of the fibres. The selection of the fabric can also, or together with, depend on the want to increase the friction between the sole and the inside of the footwear and the want to decrease the friction between the sole and the foot in the footwear. Increase of the friction between the fabric on the bottom foil and the inside of the footwear results in a much better securing of the sole in the footwear than if the friction was due to the bottom foil and the footwear. Decrease of the friction between the fabric on the top foil and the foot results in an easier gliding of the foot on the sole, which reduces the frictional heat, which arises from running or walking.

Description of the drawing

The invention will hereafter be described more detailed with reference to the accompanying drawing that shows a sectional view of an embodiment of an insole according to the invention.

The sole comprises a top foil 1 and a bottom foil 2. The top foil 1 and the bottom foil 2 are joined along the edge region 3, and between the top foil and the bottom foil a cavity 4 is formed. The cavity is filled with liquid 5, for example water. The cavity 4 can also be filled with a gel, and also other liquids than water can be contained in the cavity 4. In the shown embodiment, the top foil 1 as well as the bottom foil 2 are equipped with fabrics 6, 7. The fabrics 6, 7 are joined with the foils 1, 2 so that the fabrics 6, 7 extend on an outer side 8, 9 of the foils 1, 2. Underneath the sole, the bot-

tom 10 of a footwear is shown, and above the sole, a foot 11 with a sock 12 or a stocking is shown.

The fabrics 6, 7 are joined with the foils 1, 2, preferentially with the fibres 13, 14 in the fabrics 6, 7 situated outside an outer side of the foils. The fabrics 6, 7 are in the shown embodiment joined with the foils 1, 2 by placing a film adhesive between the outer side of the foils 1, 2 and the fabrics 6, 7. The joining is done before the foils 1, 2 are joined to form the sole.

The joining can also be done in a way that the fabrics 6, 7 are partly enclosed in the foils 6, 7. The fabrics 6, 7 are, thus, joined with the foils 1, 2 by heating the foils 1, 2 whereafter the fabrics 6, 7 are pressed partly into the foils 1, 2. In an alternative embodiment, however, the fabrics 6, 7 can be joined such that the fabrics are entirely enclosed in the foils 1, 2. The fabrics are, thus, joined with the foils 1, 2 by heating the foils 1, 2 whereafter the fabrics 6, 7 are pressed entirely into the foils 1, 2.

The foils 1, 2 are made from plastic. Joining of the foils 1, 2 along the edge region is accomplished by hot welding or high frequency welding where the top foil 1 and the bottom foil 2 are pressed together along the edge region 3 at the same time. By the welding, a bead 15 is formed extending inwards into the cavity 4. The bead 15 is formed because the material floats inwards at the location where the welding and the pressing takes place. When liquid 5 or gel subsequently is filled in between the top foil 1 and the bottom foil 2, the cavity 4 is formed.

By the formation of the cavity 4, the top foil 1 gets stretched. The thickness t of the material along that part of the top foil 1, which extend in the near vicinity of and from the welding has a thickness which is smaller than the thickness T of the material in the remaining part of the top foil 1. Under load, there is, along that part of the top foil which is stretched, a risk for breakage as a result of creep that can occur in that part, where the strength of the top foil is decreased because of the smaller material thickness t.

The fabrics 6, 7 can be of any kind of fabric with fibres 13, 14. The fabrics 6, 7 can be made of synthetic materials as polyester or of natural materials as cotton, or a mixture of fibres of different materials. Furthermore, the fabrics 6, 7 can be woven fabrics, knitted fabrics, or non-woven fabrics. As mentioned, the fabrics 6, 7, extend outside the outer sides 8, 9 of the foils 1, 2.

The fabrics 6, 7 are selected due to given mechanical and physical characteristics. Primarily, it is important that the fibres 13, 14 in the fabrics 6, 7 and the fabrics 6, 7 themselves in the plane of the fabrics 6, 7 have a tensile strength which is higher than the comparable tensile strength of the foils 1, 2 so to ensure a reduction or elimination of creep. Secondarily, the fabrics 6, 7 are selected to make allowance for needs and wants for friction, moisture absorption and other factors in connection with comfort for the foot. Thus, the fabric 14 in the bottom foil 2 is selected secondarily to provide a high frictional coefficient between that part of the fabric that extends outside the bottom foil 2 and the bottom 10 of the foot wear. The fabric 13 in the top foil 2 on the other hand is selected secondarily to provide a low frictional coefficient between that part of the fabric 13 which extends outside the topfoil 1 and the foot 11.

The foot 11 is normally furnished with an article clothing as, for example, a cotton sock or a nylon. The fabric 13 and the material of which the fabric 13 is made is, therefore, selected based on the want of a low frictional coefficient in connection with conventional textile used for socks and stockings. Furthermore, the fabric 13 on the top foil 1 can be impregnated with a fungicide to reduce the risk for epidermophytosis.

The invention is described above with reference to a sectional view of a sole according to the invention. The sectionel view is only a schematic picture of a section through a sole in as much as other soles according to the invention could look different depending on where in the sole the section is made. Also, the configuration of the cavity 4 and the distribution of eventual further cavities can imply that the sectional view is different at other locations in the sole or in other soles. Furthermore, it can occur for some sections, that there is no cavity along that section, which also is dependent on, where in the sole the section is located. It is also possible to produce soles with one or

more intermediate foils placed between the top foil and the bottom foil and eventually provided with fabrics. It is possible to provide only the top foil, only the intermediate foil, or only the bottom foil with fabric.

Furthermore, it is possible to provide the foils 1, 2 with several fabrics with different mechanical and physical characteristics to selectively make allowance for primarily the strength of the fibres 13, 14 and the fabrics 6, 7 and secondarily the frictional coefficient between the fibres, the fabrics, the bottom of the footwear, the sock and/or the foot. This can imply that at least two fabrics with different fibres or different weaves are used in the same foil or, respectively, in the top foil or bottom foil. In this case, one fabric completely contained in the foil can be provided causing strength and a second fabric, which, as shown, is found at the outer side 8, 9, of the foils or is only partly contained in the foils 1, 2, concerns the frictional coefficient at the bottom of the footwear, respectivley the foot, eventually with sock or stocking.

CLAIMS

1. An insole for footwear comprising a top foil (1) and a bottom foil (2) and one or more cavities (4), which are formed between the top foil (1) and the bottom foil (2) and filled with a liquid or a gel, and where the top foil (1) and the bottom foil (2) are impermeable with respect to the liquid (5) and are joined together at least along the edge region (3), c h a r a c t e r i s e d in that the top foil (1) as well as the bottom foil (2) are equipped with a fabric (6, 7), that the fabric (6, 7) extends to the whole of the extend of the foil between the regions (3) where the topfoil (1) is joined with the bottom foil (2), that the fabric (6, 7) extends parallel with the foil (1, 2), preferentially extends outside the outer side of the foil (1, 2), and that the fabric (6, 7) is joined with the foil (1, 2) by mechanical joining.

2. An insole as claimed in claim 1 c h a r a c t e r i s e d in that the foil (1, 2) is made from plastic, that the fabric (6, 7) is joined with the foil (1, 2) by glueing, where initially an adhesive film is placed between the foil (1, 2) and the fabric (6, 7), where the fabric (6, 7) and the foils (1, 2) thereafter are pressed together against the adhesive film, and where the adhesive film finally is hardened, whereby the fabric (6, 7) is glued on the outside (8, 9) of the foil.

3. An insole as claimed in claim 1 or 2 c h a r a c t e r i s e d in that the foil (1, 2) is made of plastic, that the fabric (6, 7) is joined with the foil (1, 2) by enclosure in the foil, where the foil (1, 2) initially is heated up, where the fabric (6, 7) subsequently is pressed partly or totally into the foil (1, 2), where the foil (1, 2) finally is cooled down, whereby that part of the fabric (6, 7), which is pressed into the foil (1, 2), is enclosed in the foil (1, 2).

4. An insole as claimed in any one of the preceding claims c h a r a c t e r i s e d in that the bottom foil (2) is equipped with a fabric (7) which with respect to an substantially smooth surface in the bottom of a footwear has a frictional coefficient which is larger than the frictional coefficient of the bottom foil (2) with respect to the substantially smooth surface in the bottom (10) of the footwear.

5. An insole as claimed in any one of the preceding claims characterised in that the top foil (1) is equipped with a fabric (6) which with respect to textile (12) as cotton, polyester or nylon has a frictional coefficient which is lower than the frictional coefficient for the top foil (2) with respect to the textile.

6. An insole as claimed in any one of the preceding claims characterised in that the fabric (6, 7) is made of fibers and is woven such that the fabric (6, 7) in every direction in the plane of the fabric (6, 7) has a tensile strength that is higher than the tensile strength for the foil (1, 2) in any direction planar with the foil.

7. An insole as claimed in any one of the preceding claims characterised in that the fabric (6) which is joined with the top foil (1) is impregnated with a fungicide.

An insole with fabric

The present invention relates to an insole for footwear.

The soles are intended for the relief of the foot, in particular the sole of the foot, by pressure equalisation, as pain in the foot and the sole of the foot is most cases is caused by concentration of pressure. Known soles use liquid contained in one or more cavities. The pressure of the contained liquid is approximately constant, and the soles will then allocate the pressure from the foot over a larger area, whereby pain in the foot or the sole of the foot is reduced. However, it is known that many kinds of material during constant load even below the yield point show permanent cold flow or creep.

The soles also have the disadvantage, that they cold flow or creep due to the continueing load, to which the soles are exposed. Thereby, the inner volume of the cavities increases so that the pressure-equalising effect is reduced and, along with that, the pain relieving effect. Furthermore, the temperature in footwear is between 20°C and 40°C, in which temperature range, the used plastic foils show a relatively large coefficient of expension for heat and a relatively large change of elasticity. As a result, the relief decreases as the sole gets warmer.

DE 40 01 542 describes such a sole, where the cavities are filled with a gas. By using a gas, a higher degree of shock absorption and/or continueing pressure equalisation is obtained, but the gas is more volatile than a liquid. Therfore, it is important that those foils which are used in such a sole have a sufficient low permeability for the used gas. To decrease the permeability and at the same time to increase the strength with regard to creep, the possibility of incorporating a film of, for example, polyethylene or polyurethane in the foils forming the cavities is described. This increases partly the impermeability of the foils and partly the strength with regard to creep. The strength with regard to creep comes about by formation of a chemical coupling between the plastic making up the foil and the film contained in the foils.

It is a disadvantage that it is necessary to enclose the film in the foils, and for cavities filled with gas, diffusion of the gas is a much bigger problem than creep. The selection of material for the film and the way the film is enclosed in the foils is, therefore, primarily directed towards the purpose of increasing the impermeability rather than increasing the strength with regard to creep. This influences the selection of material, the selection of technique for joining the film and the foil, and the choice that the film is enclosed in the foils.

According to prior art, insoles are kown to be covered with different kind of fabric. However, the function of this kind of coverage, as for instance described in US-patents no. 5 067 255 and no. 5 025 575 is to increase the comfort. From US-patent no. 3 703 169, an insole is known with an upper layer that is bonded to the insole by means of an adhesive. The upper layer is formed of a material to facilitate the easy insertion of the wearer's foot into the shoe. The fabric covers described in theses patents have no described influence on the stability of the insoles.

From US-patent 4 906 502, a pressurised insole is known, where the insole is equipped with a fabric inside the insole to maintain the planar structure of the pressurised insole. However, the fabric does not prevent creep of the outer covering.

It is the object of the present invention to provide an insole that is primarily intended for cavities filled with liquid, and where the strength with regard to creep of the foils is essentially higher than for known soles, irrespective of whether they are intended for liquids, gasses or gels.

This object is accomplished with an insole as described in claim 1.

An insole, where the foils are equipped with a fabric instead of discrete fibres and where the joining is done mechanically, implies that it is possible to undertake a precise increment of the mechanical strength of the foils by selection of specific materials

and specific textures of the fabric, and also by selection of a certain orientation of the fabric in connection with the foil and in connection with the finally fabricated sole.

The selection of fabric depends primarily on the tensile strength of the fibres in the fabric because the strength of the foil joined with the fabric among other factors depends on the tensile strength of the fibres. The selection of the fabric can also, or together with, depend on the want to increase the friction between the sole and the inside of the footwear and the want to decrease the friction between the sole and the foot in the footwear. Increase of the friction between the fabric on the bottom foil and the inside of the footwear results in a much better securing of the sole in the footwear than if the friction was due to the bottom foil and the footwear. Decrease of the friction between the fabric on the top foil and the foot results in an easier gliding of the foot on the sole, which reduces the frictional heat, which arises from running or walking.

The invention will hereafter be described more detailed with reference to the accompanying drawing that shows a sectional view of an embodiment of an insole according to the invention.

The sole comprises a top foil 1 and a bottom foil 2. The top foil 1 and the bottom foil 2 are joined along the edge region 3, and between the top foil and the bottom foil a cavity 4 is formed. The cavity is filled with liquid 5, for example water. The cavity 4 can also be filled with a gel, and also other liquids than water can be contained in the cavity 4. In the shown embodiment, the top foil 1 as well as the bottom foil 2 are equipped with fabrics 6, 7. The fabrics 6, 7 are joined with the foils 1, 2 so that the fabrics 6, 7 extend on an outer side 8, 9 of the foils 1, 2. Underneath the sole, the bottom 10 of a footwear is shown, and above the sole, a foot 11 with a sock 12 or a stocking is shown.

The fabrics 6, 7 are joined with the foils 1, 2, preferentially with the fibres 13, 14 in the fabrics 6, 7 situated outside an outer side of the foils.

The joining is done in a way that the fabrics 6, 7 are partly enclosed in the foils 6, 7. The fabrics 6, 7 are, thus, joined with the foils 1, 2 by heating the foils 1, 2 whereafter the fabrics 6, 7 are pressed partly into the foils 1, 2. In an alternative embodiment, however, the fabrics 6, 7 can be joined such that the fabrics are entirely enclosed in the foils 1, 2. The fabrics are, thus, joined with the foils 1, 2 by heating the foils 1, 2 whereafter the fabrics 6, 7 are pressed entirely into the foils 1, 2.

The foils 1, 2 are made from plastic. Joining of the foils 1, 2 along the edge region is accomplished by hot welding or high frequency welding where the top foil 1 and the bottom foil 2 are pressed together along the edge region 3 at the same time. By the welding, a bead 15 is formed extending inwards into the cavity 4. The bead 15 is formed because the material floats inwards at the location where the welding and the pressing takes place. When liquid 5 or gel subsequently is filled in between the top foil 1 and the bottom foil 2, the cavity 4 is formed.

By the formation of the cavity 4, the top foil 1 gets stretched. The thickness t of the material along that part of the top foil 1, which extend in the near vicinity of and from the welding has a thickness which is smaller than the thickness T of the material in the remaining part of the top foil 1. Under load, there is, along that part of the top foil which is stretched, a risk for breakage as a result of creep that can occur in that part, where the strength of the top foil is decreased because of the smaller material thickness t.

The fabrics 6, 7 can be of any kind of fabric with fibres 13, 14. The fabrics 6, 7 can be made of synthetic materials as polyester or of natural materials as cotton, or a mixture of fibres of different materials. Furthermore, the fabrics 6, 7 can be woven fabrics, knitted fabrics, or non-woven fabrics. As mentioned, the fabrics 6, 7, extend outside the outer sides 8, 9 of the foils 1, 2.

The fabrics 6, 7 are selected due to given mechanical and physical characteristics. Primarily, it is important that the fibres 13, 14 in the fabrics 6, 7 and the fabrics 6, 7 themselves in the plane of the fabrics 6, 7 have a tensile strength which is higher than

the comparable tensile strength of the foils 1, 2 so to ensure a reduction or elimination of creep. Secondarily, the fabrics 6, 7 are selected to make allowance for needs and wants for friction, moisture absorption and other factors in connection with comfort for the foot. Thus, the fabric 14 in the bottom foil 2 is selected secondarily to provide a high frictional coefficient between that part of the fabric that extends outside the bottom foil 2 and the bottom 10 of the foot wear. The fabric 13 in the top foil 2 on the other hand is selected secondarily to provide a low frictional coefficient between that part of the fabric 13 which extends outside the topfoil 1 and the foot 11.

The foot 11 is normally furnished with an article clothing as, for example, a cotton sock or a nylon. The fabric 13 and the material of which the fabric 13 is made is, therefore, selected based on the want of a low frictional coefficient in connection with conventional textile used for socks and stockings. Furthermore, the fabric 13 on the top foil 1 can be impregnated with a fungicide to reduce the risk for epidermophytosis.

The invention is described above with reference to a sectional view of a sole according to the invention. The sectionel view is only a schematic picture of a section through a sole in as much as other soles according to the invention could look different depending on where in the sole the section is made. Also, the configuration of the cavity 4 and the distribution of eventual further cavities can imply that the sectional view is different at other locations in the sole or in other soles. Furthermore, it can occur for some sections, that there is no cavity along that section, which also is dependent on, where in the sole the section is located. It is also possible to produce soles with one or more intermediate foils placed between the top foil and the bottom foil and eventually provided with fabrics. It is possible to provide only the top foil, only the intermediate foil, or only the bottom foil with fabric.

Furthermore, it is possible to provide the foils 1, 2 with several fabrics with different mechanical and physical characteristics to selectively make allowance for primarily the strength of the fibres 13, 14 and the fabrics 6, 7 and secondarily the frictional coefficient between the fibres, the fabrics, the bottom of the footwear, the sock and/or the foot. This can imply that at least two fabrics with different fibres or different

weaves are used in the same foil or, respectively, in the top foil or bottom foil. In this case, one fabric completely contained in the foil can be provided causing strength and a second fabric, which, as shown, is found at the outer side 8, 9, of the foils or is only partly contained in the foils 1, 2, concerns the frictional coefficient at the bottom of the footwear, respectivley the foot, eventually with sock or stocking.

CLAIMS

1. An insole for footwear comprising a plastic top foil and a plastic bottom foil and one or more cavities, which are formed between the top foil and the bottom foil and filled with a liquid or a gel, and where the top foil and the bottom foil are impermeable with respect to the liquid and are joined together at least along the edge region, wherein the top foil and well as the bottom foil are equipped with a fabric extending to the whole of the extend of the foil between the regions, where the top foil is joined with the bottom foil, wherein the fabric extends parallel with the foil, preferentially extends outside the outer side of the foil, and where the fabric is joined with the foil by mechanical joining, wherein the fabric is joined with the foil by enclosure in the foil to reinforce the mechanical strength of the foil, where the foil initially is heated up, where the fabric subsequently is pressed partly or totally into the foil, where the foil finally is cooled down, whereby that part of the fabric which is pressed into the foil, is enclosed in the foil.

2. An insole according to claim 1, wherein the bottom foil is equipped with a fabric which with respect to a substantially smooth surface in the bottom of a footwear has a frictional coefficient which is larger than the frictional coefficient of the bottom foil with respect to the substantially smooth surface in the bottom of the footwear.

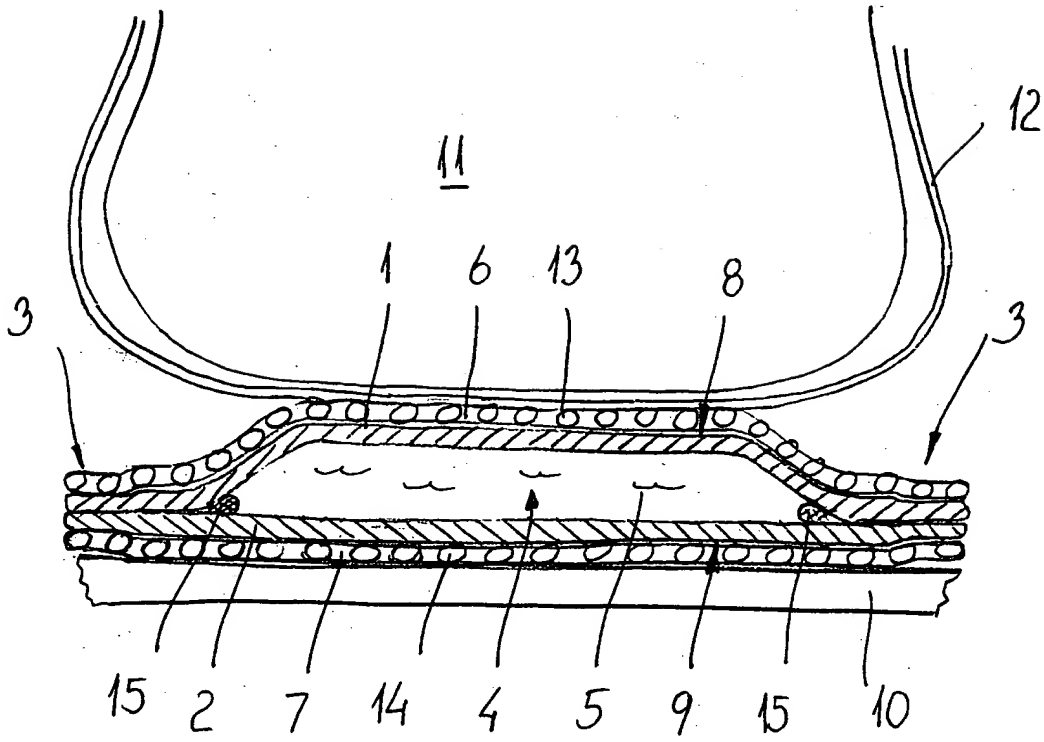
3. An insole according to claim 1, wherein the top foil is equipped with a fabric which with respect to textile as cotton, polyester or nylon has a frictional coefficient which is lower than the frictional coefficient for the top foil with respect to the textile.

4. An insole according to claim 1, wherein the fabric is made of fibers and is woven such that the fabric in every direction in the plane of the fabric has a tensile strength that is higher than the tensile strength for the foil in any direction planar with the foil.

5. An insole according to claim 1, wherein the fabric which is joined with the top foil is impregnated with a fungicide.

ABSTRACT

The invention relates to an insole for footwear. The insole comprises a top foil and a bottom foil in between which a number of cavities are formed containing liquid or gel. The top foil and/or bottom foil are equipped with fabric which in the plane of the fabric has a tensile strength that is higher than the tensile strength of the top and/or the bottom foil. Thereby, the fabric prevents creep of the plastic of which the top foil and/or the bottom foil usually are made. Preferentially, the fabric is joined with the foil such that the fabric extends on the outside or at least to the outside the foil. Thereby, the fabric constitutes a layer between the sole and the bottom of the footwear and, respectively, between the sole and the foot or the sock/stocking on the foot. Thereby, it is possible to select the frictional conditions such that the sole lies firmly in the footwear and such that the foot slides easily on the sole in order to reduce the formation of heat to the foot as a result of friction.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Correction sheet in relation to replacement sheet of 04.oct.2000 in IPER

An insole with fabric

The present invention relates to an insole for footwear, ~~as described in the preamble of claim 1~~

The soles are intended for the relief of the foot, in particular the sole of the foot, by pressure equalisation, as pain in the foot and the sole of the foot is most cases is caused by concentration of pressure. Known soles use liquid contained in one or more cavities. The pressure of the contained liquid is approximately constant, and the soles will then allocate the pressure from the foot over a larger area, whereby pain in the foot or the sole of the foot is reduced. However, it is known that many kinds of material during constant load even below the yield point show permanent cold flow or creep.

The soles also have the disadvantage, that they cold flow or creep due to the continueing load, to which the soles are exposed. Thereby, the inner volume of the cavities increases so that the pressure-equalising effect is reduced and, along with that, the pain relieving effect. Furthermore, the temperature in footwear is between 20°C and 40°C, in which temperature range, the used plastic foils show a relatively large coefficient of expension for heat and a relatively large change of elasticity. As a result, the relief decreases as the sole gets warmer.

DE 40 01 542 describes such a sole, where the cavities are filled with a gas. By using a gas, a higher degree of shock absorption and/or continueing pressure equalisation is obtained, but the gas is more volatile than a liquid. Therfore, it is important that those foils which are used in such a sole have a sufficient low permeability for the used gas. To decrease the permeability and at the same time to increase the strength with regard to creep, the possibility of incorporating a film of, for example, polyethylene or polyurethane in the foils forming the cavities is described. This increases partly the impermeability of the foils and partly the strength with regard to creep. The strength with

regard to creep comes about by formation of a chemical coupling between the plastic making up the foil and the film contained in the foils.

It is a disadvantage that it is necessary to enclose the film in the foils, and for cavities filled with gas, diffusion of the gas is a much bigger problem than creep. The selection of material for the film and the way the film is enclosed in the foils is, therefore, primarily directed towards the purpose of increasing the impermeability rather than increasing the strength with regard to creep. This influences the selection of material, the selection of technique for joining the film and the foil, and the choice that the film is enclosed in the foils.

According to prior art, insoles are kown to be covered with different kind of fabric. However, the function of this kind of coverage, as for instance described in US-patents no. 5 067 255, ~~no. 4 017 931,~~ and no. 5 025 575 is to increase the comfort. From US-patent no. 3 703 169, an insole is known with an upper layer that is bonded to the insole by means of an adhesive. The upper layer is formed of a material to facilitate the easy insertion of the wearer's foot into the shoe. The fabric covers described in theses patents have no described influence on the stability of the insoles.

From US-patent 4 906 502, a pressurised insole is known, where the insole is equipped with a fabric inside the insole to maintain the planar structure of the pressurised insole. However, the fabric does not prevent creep of the outer covering.

It is the object of the present invention to provide an insole that is primarily intended for cavities filled with liquid, and where the strength with regard to creep of the foils is essentially higher than for known soles, irrespective of whether they are intended for liquids, gasses or gels.

This object is accomplished with an insole as described in ~~the characterising part of~~ claim 1.

The fabrics 6, 7 are joined with the foils 1, 2, preferentially with the fibres 13, 14 in the fabrics 6, 7 situated outside an outer side of the foils. ~~The fabrics 6, 7 are in the shown embodiment joined with the foils 1, 2 by placing a film adhesive between the outer side of the foils 1, 2 and the fabrics 6, 7. The joining is done before the foils 1, 2 are joined to form the sole.~~

The joining is~~can also be~~ done in a way that the fabrics 6, 7 are partly enclosed in the foils 6, 7. The fabrics 6, 7 are, thus, joined with the foils 1, 2 by heating the foils 1, 2 whereafter the fabrics 6, 7 are pressed partly into the foils 1, 2. In an alternative embodiment, however, the fabrics 6, 7 can be joined such that the fabrics are entirely enclosed in the foils 1, 2. The fabrics are, thus, joined with the foils 1, 2 by heating the foils 1, 2 whereafter the fabrics 6, 7 are pressed entirely into the foils 1, 2.

The foils 1, 2 are made from plastic. Joining of the foils 1, 2 along the edge region is accomplished by hot welding or high frequency welding where the top foil 1 and the bottom foil 2 are pressed together along the edge region 3 at the same time. By the welding, a bead 15 is formed extending inwards into the cavity 4. The bead 15 is formed because the material floats inwards at the location where the welding and the pressing takes place. When liquid 5 or gel subsequently is filled in between the top foil 1 and the bottom foil 2, the cavity 4 is formed.

By the formation of the cavity 4, the top foil 1 gets stretched. The thickness t of the material along that part of the top foil 1, which extend in the near vicinity of and from the welding has a thickness which is smaller than the thickness T of the material in the remaining part of the top foil 1. Under load, there is, along that part of the top foil which is stretched, a risk for breakage as a result of creep that can occur in that part, where the strength of the top foil is decreased because of the smaller material thickness t.

The fabrics 6, 7 can be of any kind of fabric with fibres 13, 14. The fabrics 6, 7 can be made of synthetic materials as polyester or of natural materials as cotton, or a mixture of fibres of different materials. Furthermore, the fabrics 6, 7 can be woven fabrics,

CLAIMS

1. An insole for footwear comprising a plastic top foil ~~(1)~~ and a plastic bottom foil ~~(2)~~ and one or more cavities ~~(4)~~, which are formed between the top foil ~~(1)~~ and the bottom foil ~~(2)~~ and filled with a liquid or a gel, and where the top foil ~~(1)~~ and the bottom foil ~~(2)~~ are impermeable with respect to the liquid ~~(5)~~ and are joined together at least along the edge region ~~(3)~~, wherein the top foil ~~(1)~~ as well as the bottom foil ~~(2)~~ are equipped with a fabric ~~(6, 7)~~ extending to the whole of the extend of the foil between the regions ~~(3)~~, where the topfoil ~~(1)~~ is joined with the bottom foil ~~(2)~~, wherein the fabric ~~(6, 7)~~ extends parallel with the foil ~~(1, 2)~~, preferentially extends outside the outer side of the foil ~~(1, 2)~~, and where the fabric ~~(6, 7)~~ is joined with the foil ~~(1, 2)~~ by mechanical joining, wherein ~~characterised in that~~ the fabric ~~(6, 7)~~ is joined with the foil ~~(1, 2)~~ by enclosure in the foil to reinforce the mechanical strength of the foil, where the foil ~~(1, 2)~~ initially is heated up, where the fabric ~~(6, 7)~~ subsequently is pressed partly or totally into the foil ~~(1, 2)~~, where the foil ~~(1, 2)~~ finally is cooled down, whereby that part of the fabric ~~(6, 7)~~, which is pressed into the foil ~~(1, 2)~~, is enclosed in the foil ~~(1, 2)~~.

2. An insole according to claim 1, wherein ~~as claimed in any one of the preceding claims characterised in that~~ the bottom foil ~~(2)~~ is equipped with a fabric ~~(7)~~ which with respect to an substantially smooth surface in the bottom of a footwear has a frictional coefficient which is larger than the frictional coefficient of the bottom foil ~~(2)~~ with respect to the substantially smooth surface in the bottom ~~(10)~~ of the footwear.

3. An insole according to claim 1, wherein~~as claimed in any one of the preceding claims characterised in that~~ the top foil ~~(1)~~ is equipped with a fabric ~~(6)~~ which with respect to textile ~~(12)~~ as cotton, polyester or nylon has a frictional coefficient which is lower than the frictional coefficient for the top foil ~~(2)~~ with respect to the textile.

4. An insole according to claim 1, wherein~~as claimed in any one of the preceding claims characterised in that~~ the fabric ~~(6, 7)~~ is made of fibers and is woven

such that the fabric ~~(6, 7)~~ in every direction in the plane of the fabric ~~(6, 7)~~ has a tensile strength that is higher than the tensile strength for the foil ~~(1, 2)~~ in any direction planar with the foil.

5. An insole according to claim 1, whereinas ~~claimed in any one of the preceding claims characterised in that~~ the fabric ~~(6)~~ which is joined with the top foil ~~(1)~~ is impregnated with a fungicide.

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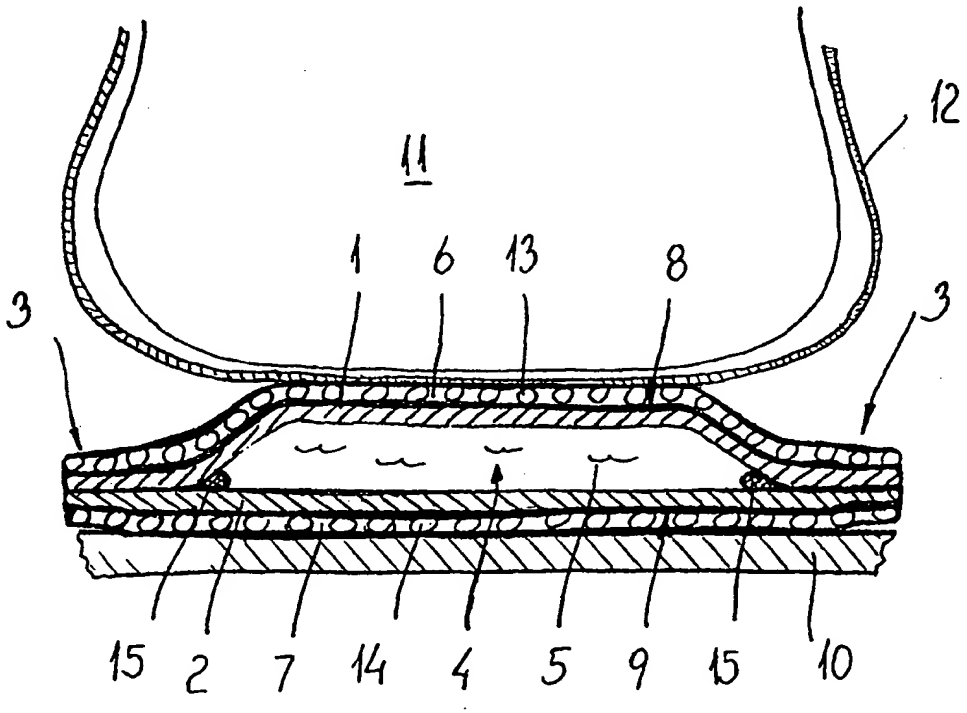
(54) Title: AN INSOLE WITH FABRIC

(57) Abstract

The invention relates to an insole for footwear. The insole comprises a top foil (1) and a bottom foil (2) in between which a number of cavities (4) are formed containing liquid or gel. The top foil (1) and/or the bottom foil (2) are equipped with fabric (6, 7) which in the plane of the fabric has a tensile strength that is higher than the tensile strength of the top (1) and/or the bottom foil (2). Thereby, the fabric (6, 7) prevents creep of the plastic of which the top foil (1) and/or the bottom foil (2) usually are made. Preferentially, the fabric (6, 7) is joined with the foil (1, 2) such that the fabric (6, 7) extend on the outside or at least to the outside the foil (1, 2). Thereby, the fabric (6, 7) constitutes a layer between the sole and the bottom of the footwear and, respectively, between the sole and the foot or the sock/stocking on the foot. Thereby, it is possible to select the frictional conditions such that the sole lies firmly in the footwear and such that the foot slides easily on the sole in order to reduce the formation of heat to the foot as a result of friction.



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(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference	FOR FURTHER ACTION	see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.
P9384PC00		
International application No.	International filing date *(day/month/year)*	(Earliest) Priority Date *(day/month/year)*
PCT/DK 99/ 00558	15/10/1999	27/10/1998
Applicant		
VINDRIIS, Sören		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 3 sheets.

[X] It is also accompanied by a copy of each prior art document cited in this report.

1. **Basis of the report**

   a. With regard to the **language,** the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

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2. [ ] **Certain claims were found unsearchable** (See Box I).

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4. With regard to the **title,**

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6. The figure of the **drawings** to be published with the abstract is Figure No. 1

   [X] as suggested by the applicant.

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   [ ] because this figure better characterizes the invention.

   [ ] None of the figures.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/DK 99/00558

A. CLASSIFICATION OF SUBJECT MATTER

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B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: A43B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5067255 A (HUTCHESON), 26 November 1991 (26.11.91), column 5, line 18 - line 40, figure 11	1-7
X	US 4017931 A (GOLDEN), 19 April 1977 (19.04.77), column 1, line 46 - line 62, figure 12	1-7
X	US 5025575 A (LAKIC), 25 June 1991 (25.06.91), column 8, line 20 - line 29; column 13, line 43 - line 47, figure 21	1-7
A	EP 0699520 A1 (NIKE INTERNATIONAL LTD ET AL), 6 March 1996 (06.03.96)	3

[X] Further documents are listed in the continuation of Box C. [X] See patent family annex.

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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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A	US 4906502 A (RUDY), 6 March 1990 (06.03.90), abstract --- --------	6

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Information on patent family members

02/12/99

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PCT/DK 99/00558

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INTERNATIONAL SEARCH REPORT

Information on patent family members

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